In re Patent Application of:
ROSSIN ET AL.
Serial No. **09/518, 421**
Filed: **MARCH 03, 2000**
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REMARKS

The specification has been amended to describe in text form inherent characteristics of the present invention as shown in Figure 3B, claims 1 and 17 have been amended and new claims 32 and 33 have been added.

In addition, a copy of the declaration, filed in response to the Notice of Missing Parts on June 7, 2000, has been submitted for the Examiner's review. Reconsideration of this application in light of the foregoing amendments and following remarks is respectfully requested.

Applicants do not understand the allegation that the oath and declaration is defective. A declaration which applicants believe complies with 37 C.F.R. § 1.67(a) identifying the present application by application number and filing date was filed on June 7, 2000. A copy of that declaration is enclosed. If a further objection is made, an explanation of the reason for the objection and the deficiency in the declaration previously filed would be appreciated.

The rejections of the claims under the provisions 35 U.S.C. § 102, and 35 U.S.C. § 103, as being unpatentable over the references to Tamanuki et al., Ventrudo and Gordon, for the reasons set forth on pages 2-4 of the outstanding Office Action, are respectfully traversed.

As is pointed out in the present specification, and as is believed to be clearly delineated in the definition of the invention in each of amended independent claims 1 and 17, the present invention relates to a semiconductor laser and a system therefore, in particular, a single stripe waveguide laser, that does not suffer from a kink in the optical output power when plotted against laser current. This is successfully achieved by tapering the lateral waveguide transition portion between first and second ends of the laser, with the output end having a relatively narrow width, which successfully prevents oscillation of the first order lateral mode, even for high power levels.

The structure and functionality of the present invention are described in detail on pages 9 and 10 of the present specification. In a preferred embodiment, the width of the laser at its narrow end is on the order of 2.3 microns, while its emission or wider end is only on the order of 4.3 microns. What results, as shown in Figure 3B, is a far field intensity profile which is relatively smooth and uniform irrespective of current. As described in the central paragraph on page 10 of the specification, the absence of any significant change in the far field beam profile, particularly the lack of beam steering, evinces the fact that there is no oscillation in the first order lateral mode, even for high power levels.

In order to underscore this aspect of the present invention, claims 1 and 17 have been amended to characterize the relatively narrow or confining width of the beam output

face, on the one hand, while also characterizing the fact that the far field beam profile is uniform and substantially smooth on either side of 0°. The substantially Gaussian nature of the far field beam profile is such that its slope on either side of 0° has a constant polarity, namely, has no discontinuities.

In contrast therewith, the tapered laser diode architecture shown in the article to Tamanuki et al. has a relatively wide light emission end (on the order of 100 microns), which results in a lateral far field beam profile that is not smooth and uniform. Instead, as shown in Figure 3 on page 726 of the article, the beam profile has a number of discontinuities where the polarity of the slope changes.

The patent to Ventrudo 6,058,128 contains no disclosure or suggestion of a tapered waveguide laser as defined in amended claims 1 and 17. What is disclosed in Ventrudo is a fiber optic architecture in which electrical drive for the laser source is modulated, to reduce the laser to repetitively switch operating states between coherence and coherence collapse. While the patent describes that the laser source provides continuous "kink-free" operation, it does not address the architecture to which the claims of the present application are directed.

The patent to Gordon discloses a generally T or H-shaped hetero-structure laser. This type of architecture suffers from the drawbacks of the prior art discussed in the initial

portion of the present specification. Gordon does not employ a tapered region that extends from the first end portion to a second end portion as defined in the amended claims, nor does Gordon describe the parameters in terms of limiting the width of the output end and the far field beam profile as defined in the amended claims.

It is respectfully submitted, therefore, that with the claims being amended to more particularly delineate applicants' invention, that the present application is in condition for allowance. Favorable reconsideration of this application is, accordingly, earnestly solicited.

Should any minor informalities need to be addressed, the Examiner is encouraged to contact the undersigned attorney at the telephone number listed below.

Please charge any shortage in fees due in connection with the filing of this paper, including Extension of Time fees, to Deposit Account No. 50-1465 and please credit any excess fees to such deposit account.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Version With Markings to Show Changes Made.**"

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Respectfully submitted,

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PATENT TRADEMARK OFFICE

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Please replace the paragraph beginning on page 10, line 13, with the following rewritten paragraph:

The output beam profile was measured in the far field for the plane parallel to the junction. The resultant beam profiles measured at 60 mW, 300 mW and 500mW output power are illustrated in Fig. 3B. The beam profiles are smooth and uniform for all currents. As shown in Fig. 3B, on either side of the peak intensity at 0°, the polarity of the slope of the far field beam profile remains constant with increase in divergence angle. The absence of any significant change in the far field beam profile at increased output power, and more specifically the lack of beam steering, is further evidence that there was no oscillation of the first order lateral mode, even for the highest power levels.

In the Claims:

Please amend the claims as follows.

1. (Amended) A light source, comprising:

a semiconductor laser including a laterally confining optical waveguide having a reflecting first end and a second end, the optical waveguide having a first portion of a first width extending a first distance from the first end and a second

portion of a second width, less than five microns, wider than said first width and extending a second distance from the second end, and a third portion extending from said first portion to said second portion and having a width that tapers from said first width of said first portion to said second width of said second portion [the first and second portions being coupled by a tapered waveguide portion having a varying lateral extent]; and

wherein [a width of the first portion is less than a width of the second portion,] the first portion filters lateral optical modes higher than a fundamental lateral optical mode, and an output is emitted from the second end of the optical waveguide, such that a far field beam profile of said output emitted from the second end of the optical waveguide has a peak at 0°, and a respective slope of said far field beam profile on either side of said peak has a polarity that remains constant with increase in divergence angle.

17. (Amended) A fiber optic system, comprising:

a communications fiber having a first end and a second end, the communications fiber including an excitable fiber medium; and

a pump laser coupled to supply pump light to the excitable fiber medium, the pump laser including a laterally confining optical waveguide having a first end of a first width provided with a high reflector, and a second end of a second width, the

optical waveguide having a first portion of said first width and extending a first distance from the first end and a second portion of said second width, less than five microns, and wider than said first width, and extending a second distance from the second end, and a third portion extending from said first portion to said second portion and having a width that tapers from said first width of said first portion to said second width of said second portion [the first and second portions being coupled by a tapered waveguide portion]; and

wherein [a width of the first portion is less than a width of the second portion], the first portion filters out lateral optical modes higher than a fundamental lateral optical mode, and an output is emitted from the second end of the optical waveguide, such that a far field beam profile of said output emitted from the second end of the optical waveguide has a peak at 0°, and a respective slope of said far field beam profile on either side of said peak has a polarity that remains constant with increase in divergence angle.

32. The light source according to claim 1, wherein said first width is on the order of 2.3 microns and said second width is on the order of 4.3 microns.

33. The system according to claim 17, wherein said first width is on the order of 2.3 microns and said second width is on the order of 4.3 microns.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: ASSISTANT COMMISSIONER OF PATENTS, U.S. PATENT AND TRADEMARK OFFICE, WASHINGTON, D.C. 20231, on this 20 day of December, 2002.

Kristen Ferguson